INSTRUCTIONS

REACTIVE VOLT-AMPERE METERS

SINGLE-PHASE AND POLYPHASE
TYPES AD-6 AND AD-7

PROPERTY OF ENGINEERING
TEST EQUIPMENT
CROSLEY, DIV. OF AVCO
ITEM 22 COPY 1

GENERAL ELECTRIC
SCHENECTADY, N.Y.

REACTIVE VOLT-AMPERE METERS

SINGLE-PHASE AND POLYPHASE
TYPES AD-6 AND AD-7

The Type AD-6 reactive volt-ampere meter is a rectangular-pattern switchboard instrument designed for surface mounting. The Type AD-7 is the same instrument except that its case is designed for flush mounting.

INSTALLATION

The instruments have removable studs; when shipped with the studs removed, exercise care to mount all stamped studs so that the letters on the ends of the studs correspond to those on the base. The lockwashers provided should be positioned between the shoulder of the stud and the base.

The sketches in this book should be followed for switchboard drilling. All wiring on the switchboard should be completed before the instruments are mounted in position.

While instruments will withstand a moderate amount of vibration and handling, shocks due to impact are likely to injure the bearings or other parts of the mechanism. Any treatment which subjects the instrument to this condition must therefore be avoided.

When there is no current flowing through the instrument, and it is properly leveled, the needle should indicate zero. Any deviation from zero should be corrected by means of the zero-setter located at the front of the instrument.

The indications are practically unaffected by stray fields, but it is advisable to follow the general practice of keeping transformers and wires carrying heavy currents at a safe distance from all indicating instruments.

The usual precautions to be observed in handling high-tension circuits must be taken in handling or installing instruments when used on circuits of high potential.

The reactive volt-ampere meters are practically unaffected by variations in wave-form and temperature. They should be used only on circuits having the frequency designated on the scale.

CONNECTIONS

Test out the leads properly and then follow the connection diagrams.

The connection diagrams in this book show approved methods of wiring up the apparatus. Other methods are possible which are electrically equivalent and which for particular installations may make more convenient or economical wiring.

All of the wiring diagrams in this book are back views.

The instruments are made for back connection only and the Type AD-6 is provided with supporting studs which serve to secure the instrument to the switchboard. The threads on the studs and nuts should be clean and bright. The contact surfaces of nuts, busbars, and cable terminals also must be thoroughly clean, to insure good contact. If at any time a nut turns hard it should be threaded over a tap of the proper dimensions. After the apparatus has been aligned, all connections should be permanently clamped.

Current leads should be large enough to carry the maximum current without undue heating. For potential leads No. 12 wire is suitable.

Single-phase Instruments

On 2-wire circuits a resistor-reactor box is used with the instrument.

Reactive volt-ampere meters are made in current capacities up to and including 20 amperes and in potential rating of 115 volts. Reactive volt-ampere meters for circuits where the current is in excess of 20 amperes are furnished with current transformers. Current transformers are required in all circuits where potential exceeds 650 volts.

Polyphase Instruments

Polyphase reactive volt-ampere meters are furnished with an internal resistor for each element of the potential circuit for all capacities up to 139 volts normal. For capacities in excess of 139 volts normal, external resistors are furnished in a ventilated cage which should be mounted in a vertical position on the back of the switchboard. The resistors for both elements are contained in a single box for voltages up to and including 650 volts. The resistor studs are lettered to correspond with the instrument studs with which they are to be connected.

On circuits having potentials in excess of 650 volts, potential transformers are provided. Polyphase reactive volt-ampere meters are made in current capacities up to and including 20 amperes. Reactive volt-ampere meters for use on circuits of more than 20 amperes or 650 volts normal are used with current transformers.

For unbalanced 3-phase 3-wire circuits, a 2-coil polyphase instrument, with a 115-volt autotransformer is used. This same equipment is also generally used to measure the reactive volt-amperes of a balanced 3-wire 3-phase circuit.

For unbalanced 2-phase 4-wire circuits, a 2-coil polyphase reactive volt-ampere meter is used without an autotransformer.

For all 3-phase 4-wire circuits a 3-current-coil instrument is furnished. When there are two potential transformers used, the potential winding of the instrument is wound for the Y or line-to-neutral voltage and an autotransformer is supplied. When three potential transformers or when no potential transformers are used the potential winding of the instrument is wound for the delta or line-to-line voltage and no autotransformer is furnished.

POLARITY MARKINGS OF TRANSFORMERS

All instrument transformers of recent manufacture have polarity markings of white paint or markers, H_1 for primary and X_1 for secondary, on or near one primary and one secondary terminal. These markings denote the relative polarity and facilitate making proper connections for correct direction of deflection of instruments. The relation of the marked leads is such that the instantaneous direction of the current in them is the same; namely, toward the transformer in the marked primary lead and from the transformer in the marked secondary lead, or vice versa. These polarity markings are indicated on the connection diagrams and should be followed irrespective of their physical location on the transformers.

GROUNDING THE CASES

It is frequently desirable to use transformers on circuits of over 150 volts. The cases of instruments which are used with current and potential transformers should be connected to the grounded side of the secondary circuit of such transformers.

For this purpose No. 12 B.&S. copper wire is suitable. Make connections to the ground stud.

At the earth end of the wire the usual precautions employed in connection with lightning arresters should be followed.

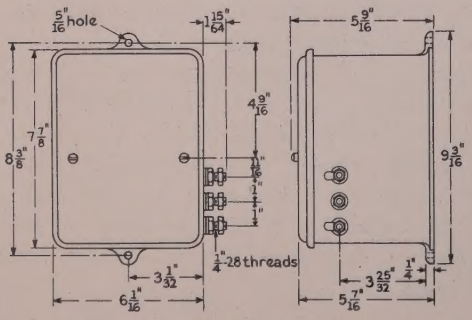

Fig. 1. Dimensions of Resistor-Reactor. For single-phase instrument when used on 2-wire circuit

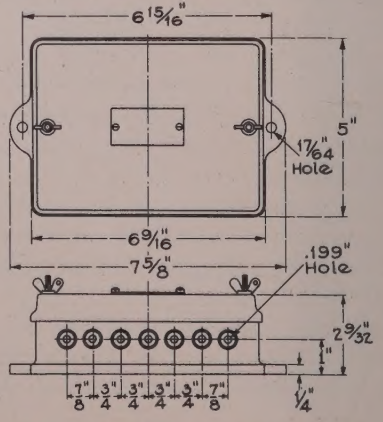

Fig. 2. Dimensions of Type MC-1 Autotransformer

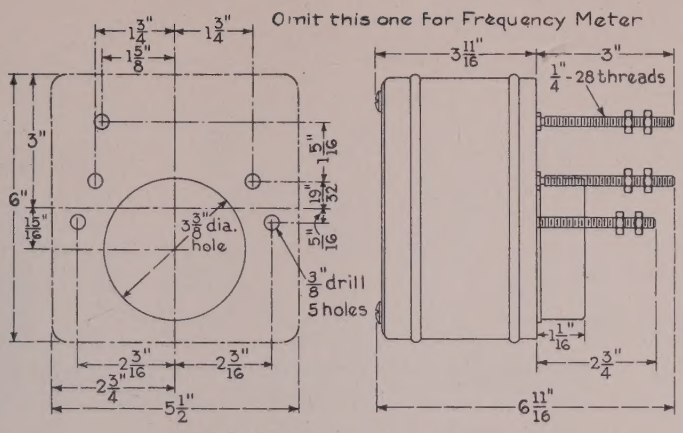

Fig. 3. Panel Drilling and Outline Dimensions of Type AD-6 Single-phase Reactive Volt-ampere Meter

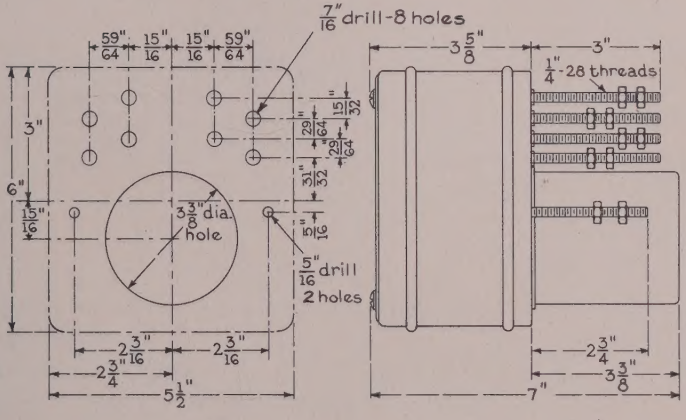

Fig. 4. Panel Drilling and Outline Dimensions of Type AD-6 Reactive Volt-ampere Meter for All Polyphase Circuits Except 4-wire 3-phase

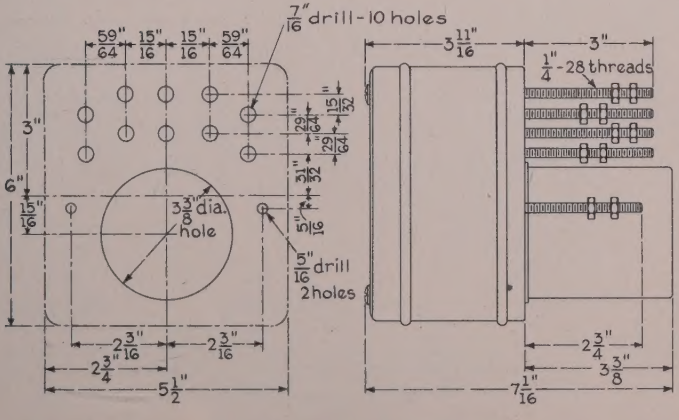

Fig. 5. Panel Drilling and Outline Dimensions of Type AD-6 Reactive Volt-ampere Meter for 4-wire 3-phase Circuits

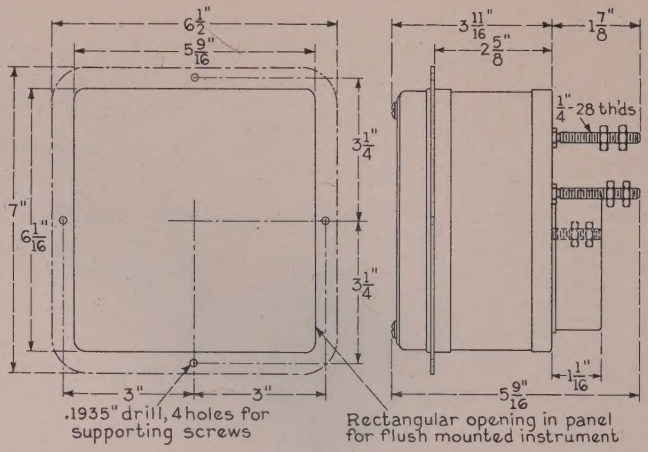

Fig. 6. Panel Drilling and Outline Dimensions of Type AD-7 Single-phase Reactive Volt-ampere Meter

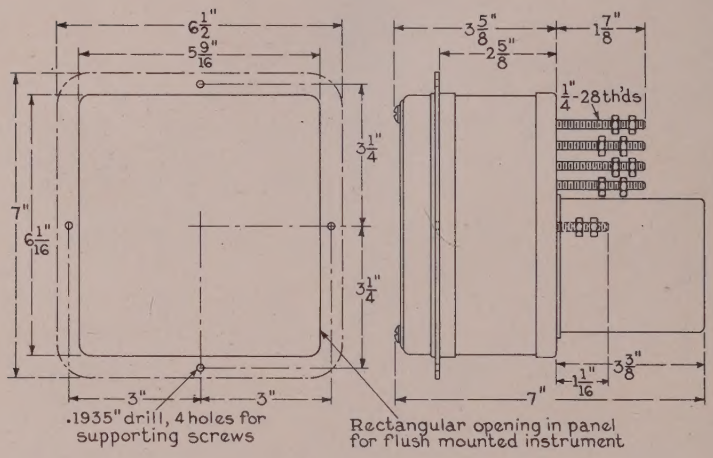

Fig. 7. Panel Drilling and Outline Dimensions of Type AD-7 Reactive Volt-ampere Meter for All Polyphase Circuits

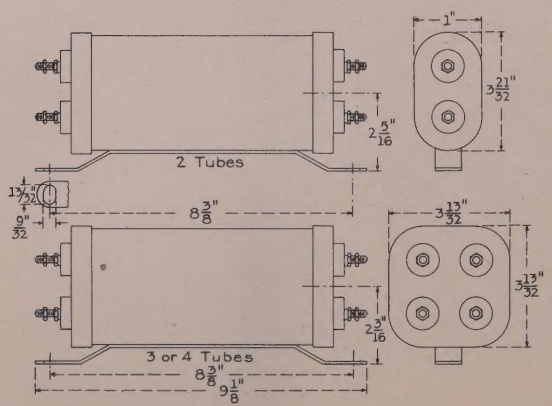

Fig. 8. Dimensions of Form 3 Resistor Cages

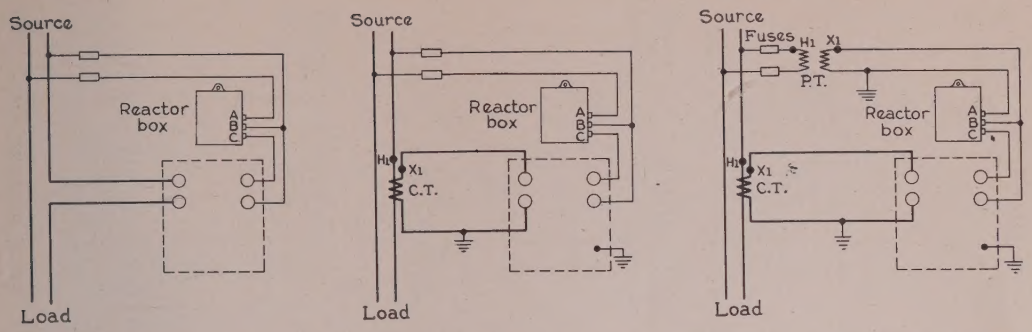

Fig. 9. Connections of Single-phase Instrument for Single-phase Circuit (Back Views)

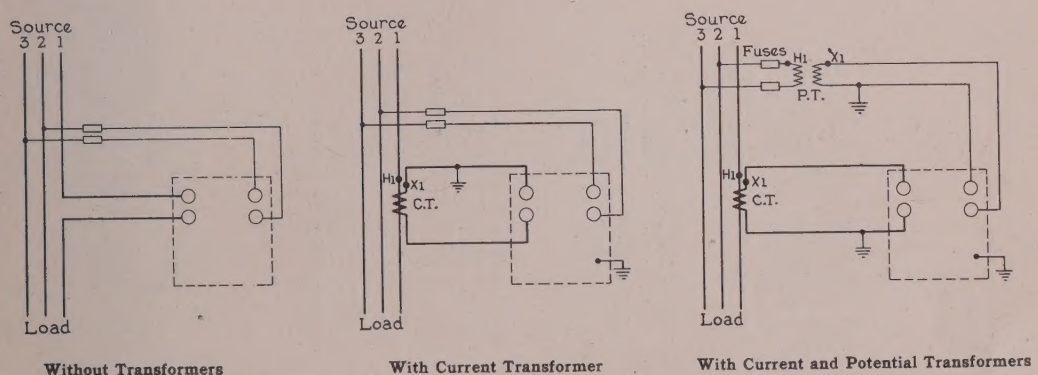

Fig. 10. Connections of Instrument with Internal Resistance, to Measure Reactive Volt-amperes on 3-wire 3-phase and 3-wire 2-phase Circuits (Back Views) See Footnote

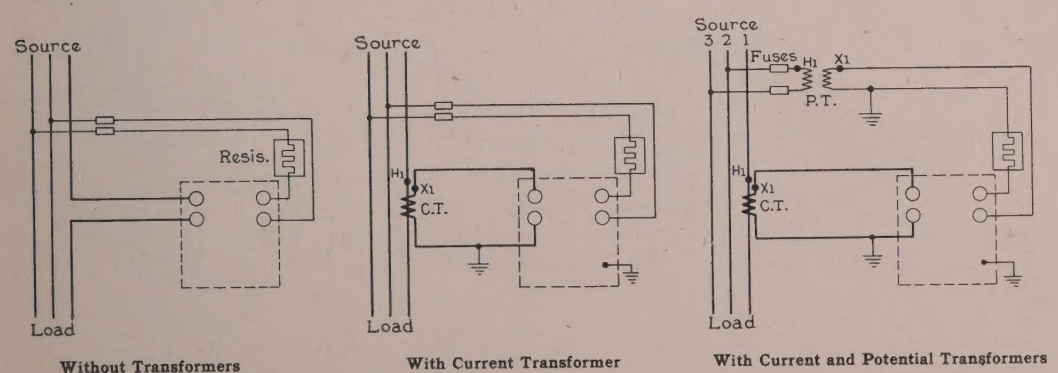

Fig. 11. Connections of Instrument with External Resistor, to Measure Reactive Volt-amperes on 3-wire 3-phase and 3-wire 2-phase Circuits (Back Views) See Footnote

NOTE.—Connections assume phase sequence 1–2–3 and pointer deflects to left on lagging power factor, "Vars Out." If instrument shows lag and lead reversed, correct by reversing current circuits of both elements.

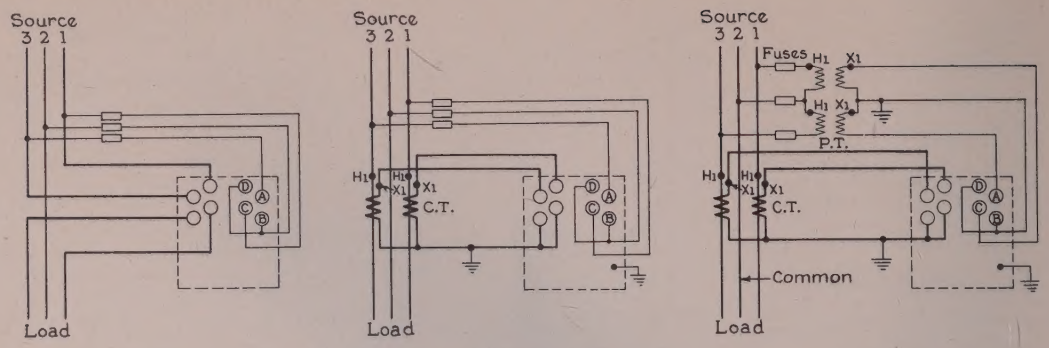

Fig. 12. Connections of Instrument for 3-wire 2-phase Circuits; Resistance Self-contained. (Back Views) See Footnote

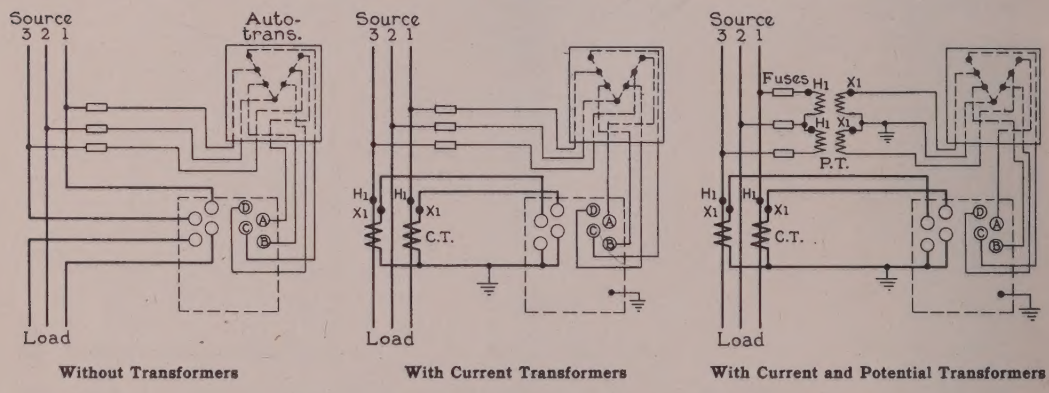

Fig. 13. Connections of Instrument with Type MC Autotransformer for 3-wire 3-phase Circuits. Resistance Self-contained. (Back Views) See Footnote

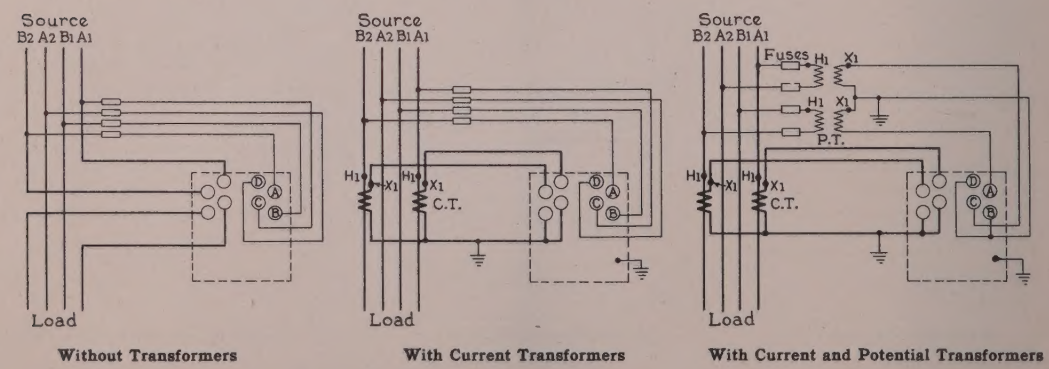

Fig. 14. Connections of Instrument on 4-wire 2-phase Circuits; Resistance Internal. (Back Views) See Footnote

NOTE.—Connections assume phase sequence 1–2–3 and pointer deflects to left on lagging power factor, "Vars Out." If instrument shows lag and lead reversed, correct by reversing current circuits of both elements.

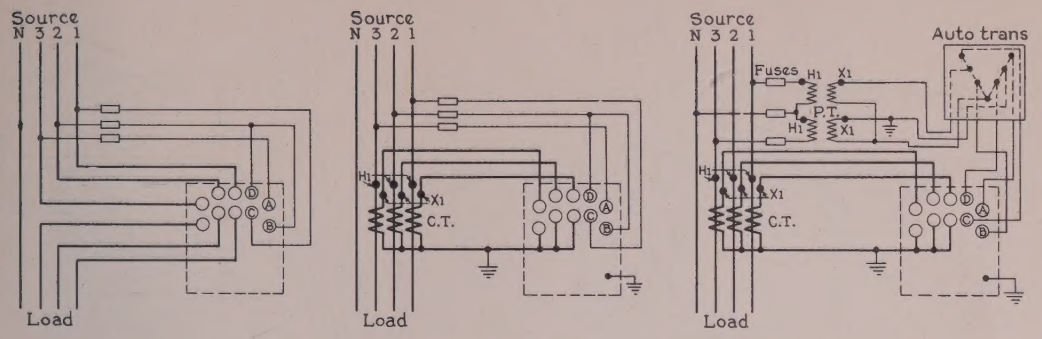

Fig. 15. Connections of Instrument on 4-wire 3-phase Circuits; Resistance Self-contained. (Back Views) See Footnote

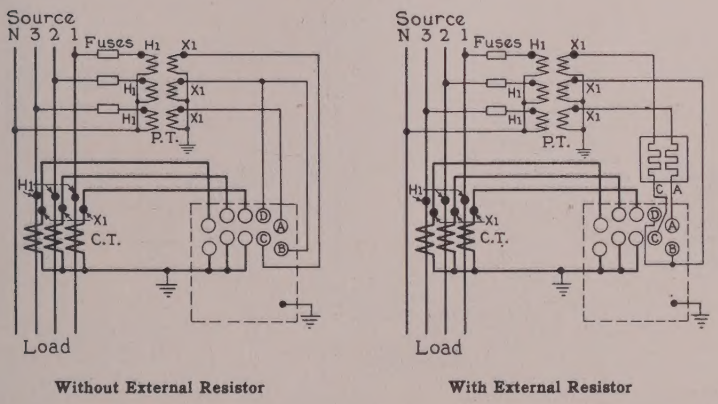

Fig. 16. Connections of Instrument on 4-wire 3-phase Circuits with 3 Potential Transformers Connected Y-Y, and 3 Current Transformers. (Back Views) See Footnote

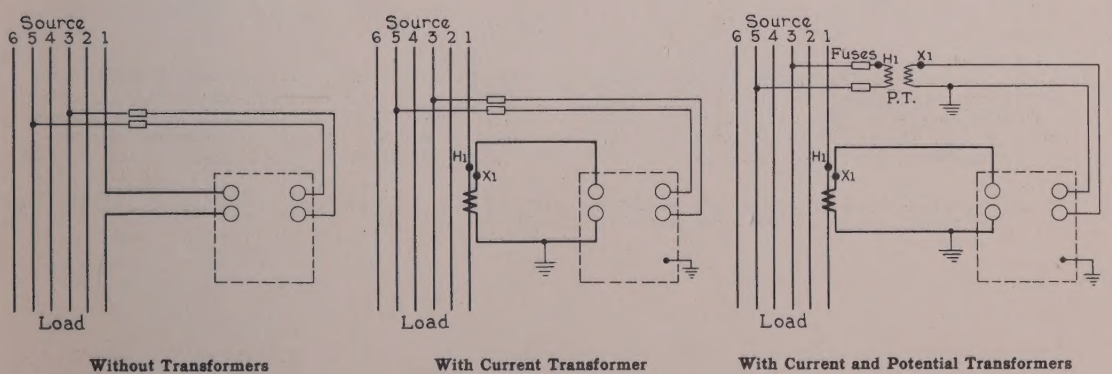

Fig. 17. Connections of Single-phase Instrument on 6-wire 6-phase Circuits; Resistance.Self-contained (Back Views)

NOTE.—Connections assume phase sequence 1–2–3 and pointer deflects to left on lagging power factor, "Vars Out." If instrument shows lag and lead reversed, correct by reversing current circuits of both elements.

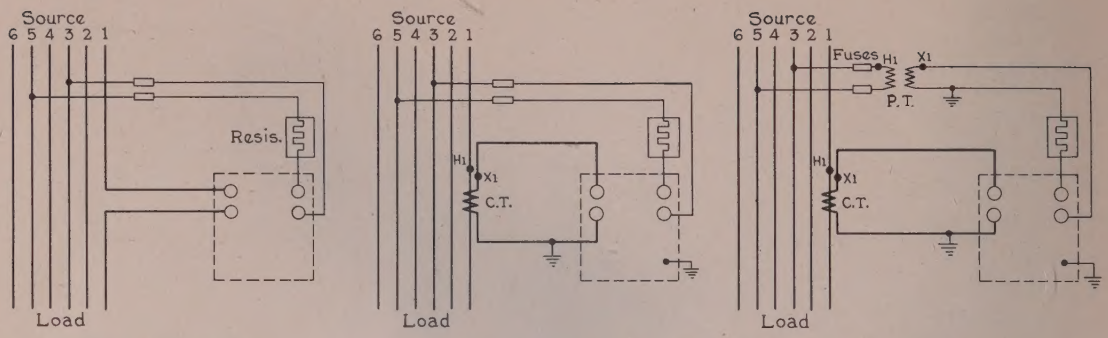

Fig. 18. Connections of Single-phase Instrument on 6-wire 6-phase Circuits; Resistance External

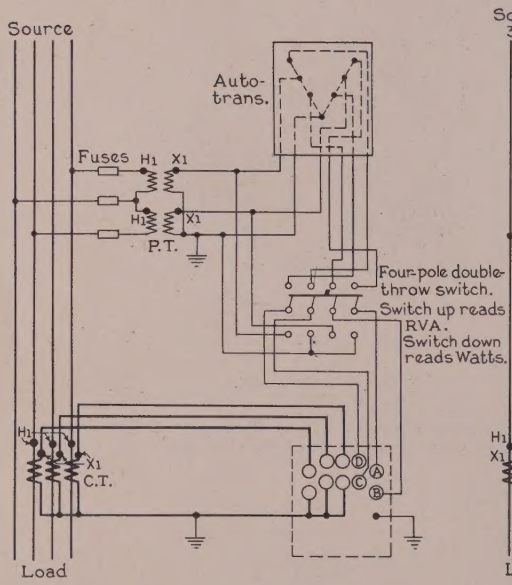

Fig. 19. Connections of Instrument with Auto-transformer on Balanced or Unbalanced 4-wire 3-phase Circuits to Measure Reactive Volt-amperes and Power Watts; Resistance Self-contained. (Back View) See Footnote

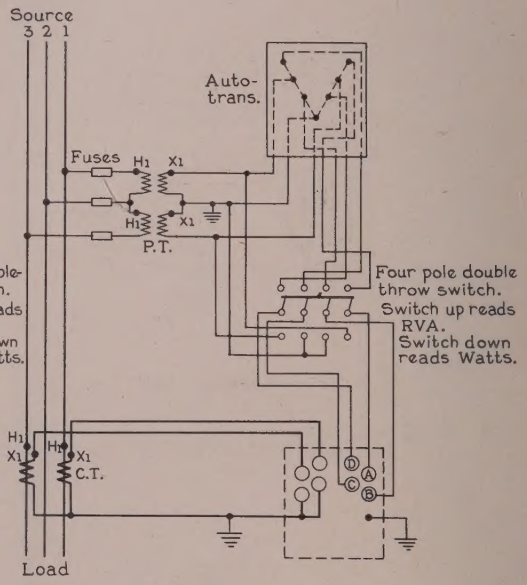

Fig. 20. Connections of Instrument with Auto-transformer to Measure Reactive Volt-amperes and Power Watts on Balanced or Unbalanced 3-wire 3-phase Circuits; Resistance Self-contained. (Back View) See Footnote

NOTE.—Connections assume phase sequence 1–2–3 and pointer deflects to left on lagging power factor, "Vars Out." If instrument shows lag and lead reversed, correct by reversing current circuits of both elements.

WHEN SERVICE IS REQUIRED

THE facilities of our engineering departments and factories are available to purchasers of G-E apparatus through G-E service shops and sales offices, a list of which is given below.

When it is necessary to renovate, repair, or change apparatus to meet a new operating condition or a new application, the facilities of the nearest G-E service shop are at your disposal. Each of them is equipped to turn out work of the same high quality, both as to workmanship and materials, as at the factory. If it is necessary that the work be done on the customer's premises, the service shop is prepared to send trained, competent, and dependable men who will do it promptly and efficiently. Similarly, the sales office nearest you will be glad to help you with any engineering problems that may be involved.

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San Francisco, Calif.	235 Montgomery Street
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Spokane, Wash.	421 Riverside Avenue
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